

W91321-04-C-0023

LOGANEnergy Corp.

Los Angeles AFB PEM Demonstration Project

Proton Exchange Membrane (PEM) Fuel Cell Demonstration  
Of Domestically Produced PEM Fuel Cells in Military Facilities

US Army Corps of Engineers  
Engineer Research and Development Center  
Construction Engineering Research Laboratory  
Broad Agency Announcement CERL-BAA-FY03

LA Air Force Base, CA Airman's Barracks

11 June 2004

## Executive Summary

Under terms of its FY'04 DOD PEM Demonstration Contract with ERDC/CERL, LOGANEnergy will install and operate a Plug Power GenSys 5kWe Combined Heat and Power fuel cell power plant at Los Angeles AFB. The unit will be sited at a very visible location at Ft MacArthur Civil Engineering Headquarters, building 56. It will be electrically configured to provide grid parallel/grid independent service and also thermally integrated with the facility's hot water system. Local electrical and mechanical contractors will be hired to provide services as needed to support the installation tasks. It is anticipated that the project will add an additional \$142.18 in energy costs to the base during the period of performance.

The LA AFB POC for this project is Eddie Wilson whose coordinates are:

[eddie.wilson@losangeles.af.mil](mailto:eddie.wilson@losangeles.af.mil) Telephone 310-363-0904

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## **Proposal – Proton Exchange Membrane (PEM) Fuel Cell Demonstration of Domestically Produced Residential PEM Fuel Cells in Military Facilities**

### **1.0 Descriptive Title**

LOGANEnergy Corp. Small Scale PEM 2004 Demonstration at Los Angeles AFB, CA.

### **2.0 Name, Address and Related Company Information**

LOGANEnergy Corporation

1080 Holcomb Bridge Road  
BLDG 100- 175  
Roswell, GA 30076  
(770) 650- 6388

DUNS 01-562-6211  
CAGE Code 09QC3  
TIN 58-2292769

LOGANEnergy Corporation is a private Fuel Cell Energy Services company founded in 1994. LOGAN specializes in planning, developing, and maintaining fuel cell projects. In addition, the company works closely with manufacturers to implement their product commercialization strategies. Over the past decade, LOGAN has analyzed hundreds of fuel cell applications. The company has acquired technical skills and expertise by designing, installing and operating over 30 commercial and small-scale fuel cell projects totaling over 7 megawatts of power. These services have been provided to the Department of Defense, fuel cell manufacturers, utilities, and other commercial customers. Presently, LOGAN supports 30 PAFC and PEM fuel cell projects at 21 locations in 12 states, and has agreements to install 22 new projects in the US and the UK over the next 18 months.

### **3.0 Production Capability of the Manufacturer**

Plug Power manufactures a line of PEM fuel cell products at its production facility in Latham, NY. The facility produces three lines of PEM products including the 5kW GenSys5C natural gas unit, the GenSys5P LP Gas unit, and the GenCor 5kW standby power system. The current facility has the capability of manufacturing 10,000 units annually. Plug will support this project by providing remote monitoring, telephonic field support, overnight parts supply, and customer support. These services are intended to enhance the reliability and performance of the unit and achieve the highest possible customer satisfaction. Scott Wilshire is the Plug Power point of contact for this project. His phone number is 518.782.7700 ex1338, and his email address is [scott\\_wilshire@plugpower.com](mailto:scott_wilshire@plugpower.com).

#### 4.0 Principal Investigator(s)

Name	Samuel Logan, Jr.	Keith Spitznagel
Title	President	Vice President Market Engagement
Company	Logan Energy Corp.	Logan Energy Corp.
Phone	770.650.6388 x 101	860.210.8050
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#### 5.0 Authorized Negotiator(s)

Name	Samuel Logan, Jr.	Keith Spitznagel
Title	President	Vice President Market Engagement
Company	Logan Energy Corp.	Logan Energy Corp.
Phone	770.650.6388 x 101	860.210.8050
Fax	770.650.7317	770.650.7317
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#### 6.0 Past Relevant Performance Information

##### a) Contract: PC25 Fuel Cell Service and Maintenance Contract #X1237022

Merck & Company  
Ms. Stephanie Chapman  
Merck & Company  
Bldg 53 Northside  
Linden Ave. Gate  
Linden, NJ 07036  
(732) 594-1686

Contract: Four-year PC25 PM Services Maintenance Agreement.

In November 2002 Merck & Company issued a four-year contract to LOGAN to provide fuel cell service, maintenance and operational support for one PC25C fuel cell installed at their Rahway, NJ plant. During the contract period the power plant has operated at 94% availability.

##### b) Contract: Plug Power Service and Maintenance Agreement to support one 5kWe GenSys 5C and one 5kWe GenSys 5P PEM power plant at NAS Patuxant River, MD.

Plug Power

Mr. Scott Wilshire.  
968 Albany Shaker Rd.  
Latham, NY 12110  
(518) 782-7700 ex 1338

LOGAN performed the start-up of both units after Southern Maryland Electric Cooperative completed most of the installation work and continues to provide service and maintenance during the period of performance.

- c) Contract: A Partners LLC Commercial Fuel Cell Project Design, Installation and 5-year service and maintenance agreement.  
Contract # A Partners LLC, 12/31/01

Mr. Ron Allison  
A Partner LLC  
1171 Fulton Mall  
Fresno, CA 93721  
(559) 233-3262

On April 20, 2004 LOGAN completed the installation of a 600kWe PC25C CHP fuel cell installation in Fresno, CA. The fuel cells also provide low-grade waste heat at 140 degrees F that furnishes thermal energy to 98 water source heat pumps located throughout the 12-story building during the winter months.

## 7.0 Host Facility Information



Los Angeles AFB



Fort MacArthur Base Housing

Los Angeles Air Force Base is located within El Segundo city limits, the base is divided into two areas; Area A where most major units are located, and Area B which houses the 61 Air Base Group, the clinic, BX, and the commissary.

Space and Missile Systems Center (SMC) traces its origins to the Western Development Division created in July 1954. The organization's original mission was to develop ICBMs and the results are a proud legacy with the early Atlas, Thor, and Titan of the 50s, through the Minuteman of

the 60s, to the Peacekeeper of the 80s. SMC has been the center of military satellite development since 1956. The Center has contributed to maintaining peace through programs such as early warning systems, meteorological, navigation and communications satellites to serve combat forces.

Space and Missile Systems Center, part of Air Force Materiel Command, is responsible for research, development, acquisition, on-orbit testing and sustainment of military space and missile systems. In addition to managing Air Force space and missile programs, SMC participates in space programs conducted by other U.S. military services, government agencies and North Atlantic Treaty Organization allies. SMC responds to user needs by developing and acquiring space systems. After launch and check-out, SMC turns these systems over to the appropriate operating command. SMC also serves as the integrating center for the Strategic Defense Initiative within AFMC. It monitors progress in more than 70 Space Defense Initiative efforts throughout AFMC. SMC itself has direct management responsibility for more than half of these efforts.

Fort MacArthur is a former Army installation acquired by the Air Force in 1982. It is named in honor of Lt. Gen. Arthur MacArthur, father of Douglas MacArthur, who later commanded American forces in the Pacific during World War II. At present, Fort MacArthur serves as a residential community for personnel of the Air Force Space Division Based at El Segundo. Fort MacArthur, the actual site for the fuel cell installation, is in San Pedro, about 13 miles south of the main base.

## 8.0 Fuel Cell Site Information

The photos below are taken at the LA AFB Civil Engineering Office, Building 56. After conducting a preliminary site visits, LOGAN and the base POC reached consensus that the small office facility located at the Ft MacArthur base complex would provide the best opportunity to display the fuel cell and install it to best effect. Utility connections are within 50 feet of the pad site, which will be located at the side of the building viewed in the photo on the right below.





## 9.0 Electrical System

The Plug Power GenSys 5C PEM fuel cell power plant provides both grid parallel and grid independent operating configurations for site power management. This capability is an important milestone in the development of the GenSys5 product and for the PEM Program itself, as it is a significant developmental step on the pathway to product commercialization. The unit has a power output of 110/120 VAC at 60 Hz, and when necessary the voltage can be adjusted to 208vac or 220vac depending upon actual site conditions. The photo at right shows the electrical service

panel in the basement of Building 56 where the fuel cell will be electrically coupled to the base utility grid. A new fuel cell emergency panel will be installed adjacent to the existing panels and will have several non-critical circuits attached to simulate the fuel cell's stand-by power application.



## 10.0 Thermal Recovery System



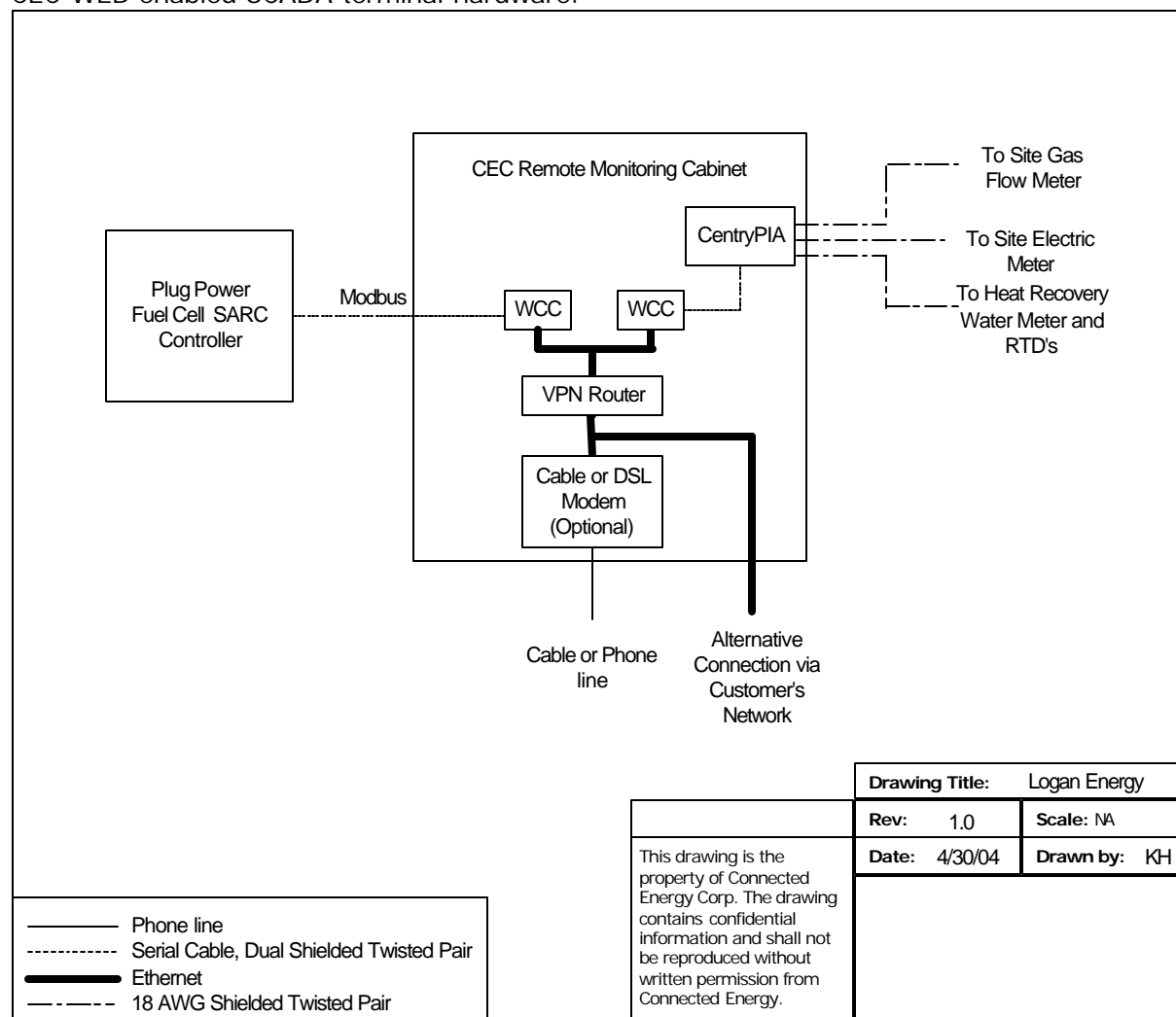
LOGAN intends to employ a Heliodyne heat exchanger to capture fuel cell waste heat and transfer it into the facility's hot water heater, pictured in the photo at left. The Heliodyne is a looped coil within a coil design that provides double wall protection between the heat source and the heat sink. It was designed primarily for the solar heating industry, but has proved to be very adaptable to the fuel cell industry as well. The Heliodyne will mount either directly to one of the storage tanks or on an adjacent wall. It has its own pump that circulates the storage tank in a counter flow against incoming hot water provided by the fuel cell's heat exchanger. While operating at a set point of 2.5 kWh, the fuel cell provides 7800 Btuh to the storage tank at approximately 140 degrees F. Later in the project LOGAN hopes to gain the cooperation of the base utility engineer in order to map the thermal recovery system to develop a clear picture of its effectiveness in this application.



## 11.0 Data Acquisition System

LOGAN proposes to install a Connected Energy Corporation web based SCADA system that provides real time monitoring of the power plant. The schematic drawing seen below describes the architecture of the CEC hardware that will support the project. The system provides a comprehensive data acquisition solution and also incorporates remote control, alarming, notification, and reporting functions. The system will pick up and display a number of fuel cell operating parameters on functional display screens including kWh, cell stack voltage, and water management, as well as external instrumentation inputs including Btus, fuel flow, and thermal loop temperatures. CEC's Operations Control Center in Rochester, New York, collects, stores, displays, alarms, archives site data, and maintains connectivity by means of a Virtual Private Network that will link the fuel cell to CEC's control center.

CEC WEB enabled SCADA terminal hardware.



## 12.0 Economic Analysis

<b>Los Angeles AFB, CA</b>				
<b>Project Utility Rates</b>				
1) Water (per 1,000 gallons)		\$	0.85	
2) Utility (per KWH)		\$	0.065	
3) Natural Gas ( per MCF)		\$	6.55	
<b>First Cost</b>			<b>Estimated</b>	<b>Actual</b>
Plug Power 5 kW SU-1		\$	65,000.00	
Shipping		\$	2,400.00	
Installation electrical		\$	2,800.00	
Installation mechanical & thermal		\$	6,300.00	
Watt Meter, Instrumentation, Web Package		\$	1,285.00	
Site Prep, labor materials		\$	825.00	
Technical Supervision/Start-up		\$	4,500.00	
Total		\$	<b>83,110.00</b>	
<b>Assume Five Year Simple Payback</b>			\$ 16,622.00	\$ -
<b>Forecast Operating Expenses</b>	Volume	\$/Hr	\$/ Yr	
Natural Gas Mcf/ hr @ 2.5kW	0.0330	\$ 0.22	\$ 1,704.13	
Water Gallons per Year	14,016		\$ 11.91	
<b>Total Annual Operating Cost</b>				\$ 1,716.04
<b>Economic Summary</b>				
Forecast Annual kWh			19710	
Annual Cost of Operating Power Plant		\$	0.087 kWh	
Credit Annual Thermal Recovery Rate			(\$0.015) kWh	
Project Net Operating Cost		\$	0.072 kWh	
Displaced Utility cost		\$	0.065 kWh	
<b>Energy Savings (Cost)</b>			(\$0.007) kWh	
<b>Annual Energy Savings (Cost)</b>			(\$142.18)	

## 13.0 Kickoff Meeting Information

The project kick-off meeting occurred at Los Angeles AFB at 11:00 am on June 22, 2004. The attendees were Mr. Eddie Wilson representing the LA AFB, Dr. Mike Binder, representing CERL, and Sam Logan and George Collard representing LOGANEnergy.

## 14.0 Status/Timeline

Please see Appendix 2.

## Appendix

1. Sample form used to qualify the fuel cell for initial start and the project acceptance test.

### **Installation/Acceptance Test Report**

Site: Los Angeles AFB, CA

#### **Installation Check List**

<b>TASK</b>	<b>Initials</b>	<b>DATE</b>	<b>TIME (hrs)</b>
Batteries Installed	GC		
Stack Installed	GC		
Stack Coolant Installed	GC		
Air Purged from Stack Coolant	GC		
Radiator Coolant Installed	GC		
Air Purged from Radiator Coolant	GC		
J3 Cable Installed	GC		
J3 Cable Wiring Tested	GC		
Inverter Power Cable Installed	GC		
Inverter Power Polarity Correct	GC		
RS 232 /Modem Cable Installed	GC		
DI Solenoid Cable Installed with Diode	GC		
Natural Gas Pipe Installed	GC		
DI Water / Heat Trace Installed	GC		
Drain Tubing Installed	GC		

#### **Commissioning Check List and Acceptance Test**

<b>TASK</b>	<b>Initials</b>	<b>DATE</b>	<b>TIME (hrs)</b>
Controls Powered Up and Communication OK	GC		
SARC Name Correct	GC		
Start-Up Initiated	GC		
Coolant Leak Checked	GC		
Flammable Gas Leak Checked	GC		
Data Logging to Central Computer	GC		
System Run for 8 Hours with No Failures	GC		

## Appendix 2

